

LCD- MODUL 4x20 - 6.45mm

Issue 01.2013

INCL. CONTROLLER KS0073

not for new
designs



FEATURES

- * HIGH-CONTRAST LCD-SUPERTWIST DISPLAY
- * BLUE BACKGROUND WITH WHITE CHARACTERS
- * BLACK&WHITE FSTN
- * EXTREME COMPACT WITH 75mm WIDTH
- * BUILT-IN CONTROLLER KS0073 (VERY SIMILAR TO HD44780)
- * 4- AND 8-BIT INTERFACE FOR DATABUS
- * SERIAL SPI-INTERFACE (SID, SOD, SCLK, CS)
- * POWER SUPPLY +3.3..5.0V / TYP. 4mA (w./o. B./L.)
- * OPERATING TEMP. RANGE -20..+70°C
- * AUTOMATIC TEMPERATURE COMPENSATION BUILT-IN
- * LED-BACKLIGHT WHITE, max. 75mA@+25°C
- * $U_{f(LED)} = 3.0\sim 3.6V$
- * 16 ICONS (BATTERY, ARROWS ETC.) AT THE TOP EDGE
- * NO MONTING IS REQUIRED: JUST SOLDER INTO PCB
- * SINGLE ROW SOCKET AVAILABLE: EA B254-12 (1 PC.)
- * 128x64 GRAPHIC WITH SAME DIMENSION AND SAME PINOUT: EA DIP128

ORDERING INFORMATION

LCD-MODULE 4x20 - 6.45mm WITH LED-B./L. BLUE
FSTN BLACK ON WHITE
SOCKET 4.5mm HEIGHT, 12 POSITIONS (1 PC.)

EA DIP204B-6NLW
EA DIP204J-6NLW
EA B254-12

**ELECTRONIC
ASSEMBLY**
making things easy

PINOUT

4-/8-Bit Mode (Factory Set)			
Pin Symbol	Function	Pin Symbol	Function
1	VSS	13	not connected
2	VDD	14	VSS
3	VCI	15	D0
4	RES	16	D1
5	RS	17	D2
6	R/W	18	D3
7	E	19	D4 (D0)
8	not connected	20	D5 (D1)
9	not connected	21	D6 (D2)
10	not connected	22	D7 (D3)
11	not connected	23	A
12	not connected	24	C

SPI Mode (Solder link changed to "SPI")			
Pin Symbol	Function	Pin Symbol	Function
1	VSS	13	not connected
2	VDD	14	VSS
3	VCI	15	SOD
4	RES	16	not connected
5	CS	17	not connected
6	SID	18	not connected
7	SCLK	19	not connected
8	not connected	20	not connected
9	not connected	21	not connected
10	not connected	22	not connected
11	not connected	23	A
12	not connected	24	C

BACKLIGHT

Using the LED backlight requires an current source or external current-limiting resistor. Forward voltage for white LED backlight is 3.0~3.6V. Please take care of derating for $T_a > +25^{\circ}C$

Attention: Do never drive backlight directly to 5V; this may damage backlight immediately !
The blue display cannot be read without backlight. For direct sunlight we suggest to use the J-type.

TABEL OF COMAND (KS0073, IE=HIGH)

Instruction	C ode											Description	Execute Time (270kHz)
	RE Bit	RS	R/W	DB 7	DB 6	DB 5	DB 4	DB 3	DB 2	DB 1	DB 0		
Clear Display	*	0	0	0	0	0	0	0	0	0	1	Clears all display and returns the cursor to the home position (Address 0).	1.53ms
Cursor At Home	0	0	0	0	0	0	0	0	0	1	*	Returns the Cursor to the home position (Address 0). Also returns the display being shifted to the original position. DD RAM contents remain unchanged.	1.53ms
Power Down Mode	1	0	0	0	0	0	0	0	0	1	PD	Set Power down mode bit. PD=0: powerdown mode disable PD=1: powerdown mode enable	39µs
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Cursor moving direction (I/D=0: dec; I/D=1: inc) shift enable bit (S=0: disable; S=1: enable shift)	39µs
Display On/Off Control	0	0	0	0	0	0	0	1	1	BID	BID	Segment bidirectional function (BID=0: Seg1->Seg60; BID=1: Seg60->Seg1)	39µs
extended Function Set	1	0	0	0	0	0	0	1	FW	BW	NW	FW=0: 5-dot font width; FW=1: 6-dot font width BW=0: normal cursor; BW=1: inverting cursor NW=0: 1- or 2-line (see N); NW=1: 4-line display	39µs
Cursor / Display Shift	0	0	0	0	0	0	1	S/C	R/L	*	*	Moves the Cursor or shifts the display S/C=0: cursor Shift; S/C=1: display shift R/L=0: shift to left; R/L=1: shift to right	39µs
Scroll Enable	1	0	0	0	0	0	1	H4	H3	H2	H1	Determine the line for horizontal scroll	39µs
Function Set	0	0	0	0	0	1	DL	N	RE	DH	REV	sets interface data length (DL=0:4-bit; DL=1:8-bit) number of display lines (N=0: 1-line; N=1: 2-line) extension register (RE= 0/1) scroll/shift (DH=0: dot scroll; DH=1: display shift) reverse bit (REV=0:normal; REV=1:inverse display)	39µs
CG RAM Address Set	1	0	0	0	0	1	DL	N	RE	BE	LP	CG-/SEG-RAM blink (BE=0: disable; BE=1: enable) LP=0: normal mode; LP=1: low power mode	39µs
SEG RAM Address Set	1	0	0	0	1	*	*	AC				Sets the SEG RAM address. SEG RAM data is sent and received after this setting.	39µs
DD RAM Address Set	0	0	0	1				AC				Sets the DD RAM address. DD RAM data is sent and received after this setting.	39µs
Set Scroll Quantity	1	0	0	1	*			SQ				Sets the quantity of horizontal dot scroll (DH=0)	39µs
Busy Flag / Address Read	*	0	1	BF				AC				Reads Busy flag (BF) indicating internal operation is being performed and reads address counter contents.	-
Write Data	*	1	0					Write Data				Writes data into internal RAM (DD RAM / CG RAM / SEG RAM)	43µs
Read Data	*	1	1					Read Data				Reads data from internal RAM (DD RAM / CG RAM / SEG RAM)	43µs

Example of initialisation, 8 bit mode													
Command	RE Bit	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Hex	Note
Function Set	0	0	0	0	0	1	1	0	0	0	0	\$30	8 bit data length, extension bit RE=0
Entry Mode Set	0	0	0	0	0	0	0	0	1	1	0	\$06	Cursor Auto-Increment
Function Set	0	0	0	0	0	1	1	0	1	1	0	\$36	8 bit data length, RE =1, blink enable BE =1
ext. Function Set	1	0	0	0	0	0	0	1	0	0	1	\$09	4 line mode
Set SEGRAM adr	1	0	0	0	1	0	0	0	0	0	0	\$40	Icon RAM address: \$00
16 x Write Data	1	1	0	0	0	0	0	0	0	0	0	\$00	to clear all icons: write 16x \$00
Function Set	1	0	0	0	0	1	1	0	0	0	0	\$30	8 bit data length, bit RE =0
Display ON/OFF	0	0	0	0	0	0	0	1	1	1	1	\$0F	Display on, Cursor on, Cursor blink
Clear Display	0	0	0	0	0	0	0	0	0	0	1	\$01	Clear display, place cursor to 1st. col. /1st. row

Adress:
 1st. line \$00..\$13
 2nd. line \$20..\$33
 3rd. line \$40..\$53
 4th. line \$60..\$73

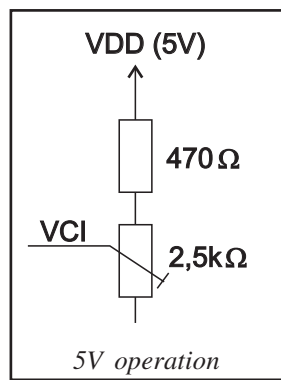
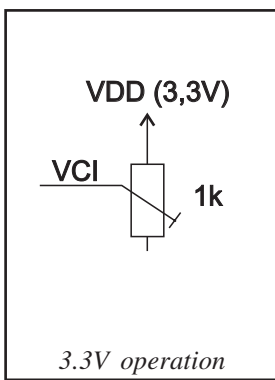
Please make shure that software will check busy-flag before writing any command !

CHARACTER SET

Beside there's a copy of built.in character set. In addition to that up to 8 individual character can be created.

CONTRAST ADJUSTMENT

Contrast will be set by pin 3 (VCI). Module EA DIP204 comes with built-in temperature compensation for -20..+70°C as a standard; any contrast adjustment while operation is no longer required.



Upper bit	Lower bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLH	HHHL	HHHH
CG RAM (1)	LLLL	▶	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(2)	LLLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(3)	LLHL	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(4)	LLHH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(5)	LHLL	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(6)	LHLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(7)	LHHL	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(8)	LHHH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(1)	HLLL	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(2)	HLLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(3)	HLHL	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(4)	HLHH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(5)	HHLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(6)	HHLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(7)	HHLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀
(8)	HHLH	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀	◀

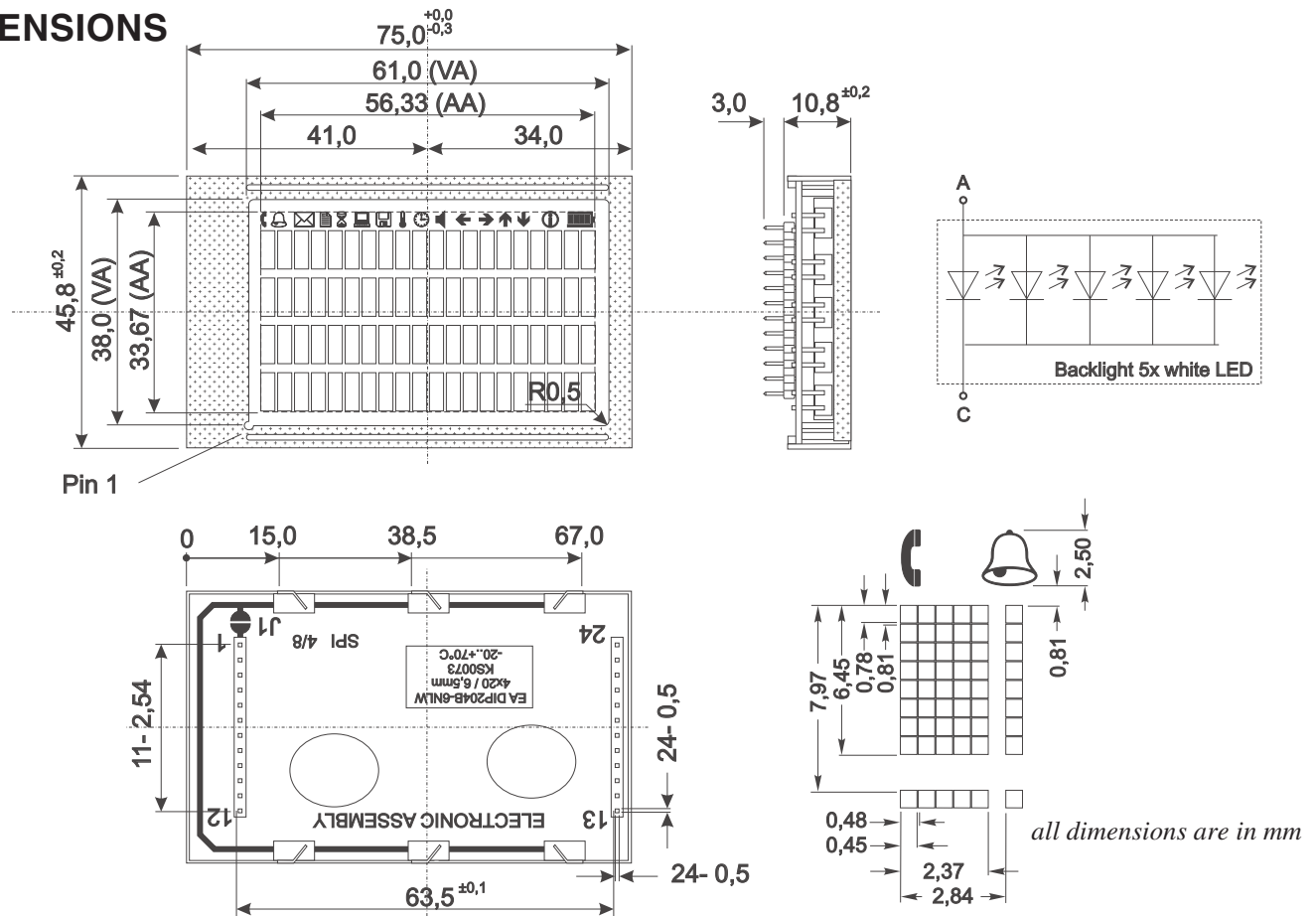
CREATING YOUR OWN CHARACTERS

All these character display modules got the feature to create 8 own characters (ASCII Codes 0..7) in addition to the 240 ROM fixed codes.

- 1.) The command "CG RAM Address Set" defines the ASCII code (Bit 3,4,5) and the dot line (Bit 0,1,2) of the new character. Example demonstrates creating ASCII code \$00.
- 2.) Doing 8 times the write command "Data Write" defines line by line the new character. 8th. byte stands for the cursor line.
- 3.) The new defined character can be used as a "normal" ASCII code (0..7); use with "DD RAM Address Set" and "Data Write".

Set CG RAM Address				Data					
Adresse		Hex	Bit					Hex	
7	6	5	4		3	2	1		0
0	1	0	0	0	0	0	0	0	\$04
				0	0	1	0	0	\$04
				0	1	0	0	0	\$04
				0	1	1	0	0	\$04
				1	0	0	0	0	\$15
				1	0	1	0	0	\$0E
				1	1	0	0	0	\$04
				1	1	1	0	0	\$00

DIMENSIONS



DRIVING THE SYMBOLS

After power-on symbols will be set accidental. To switch off them all please refer to the example of initializing on page 3. To display an individual symbol have a look at the program example at the right.

Each symbol can be displayed in normal (solid) and blinking style.

Example program to display an icon (8 bit mode interface)													
Command	RE Bit	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Hex	Note
Busy-Flag / Address read	0	0	1	BF	AC								perhaps store current DDRAM address: read AC and save as LASTADR=AC
Function Set	0	0	0	0	0	1	1	0	1	1	0	\$36	Set to 8 bit data length, RE=1, Blink enable BE=1
Set SEGRAM adr	1	0	0	0	1	0	0	0	0	1	0	\$42	Set Icon-RAM address to \$02 (letter symbol)
Write Data	1	1	0	0	0	0	1	0	0	0	0	\$10	Write \$10 to display symbol
Function Set	1	0	0	0	0	1	1	0	0	0	0	\$30	Set to 8 bit data length, extension bit RE=0
Set DDRAM adr	0	0	0	1	LASTADR								Restore DDRAM address

Icon - Symbols																			
SEGRAM address	☎	🔔	✉	📄	⌚	💻	📁	🔦	🕒	🔊	⬅	➡	⬆	⬇	📶	📶			
data solid	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$1F	\$1E	\$1C	\$18	\$10
data blink (BE=1!)	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50					\$50

SERIAL MODE SPI

Factory set for interface is parallel with 4 bit or 8 bit data bus. Alternative module can be programmed with serial data stream. For that solder link 4/8 has to be opened and closed to SPI side. Hardware specification for serial operation mode is written down in user manual for KS0073: <http://www.lcd-module.de/eng/pdf/zubehoer/ks0073.pdf>. Software for initialisation and programming keeps the same.